

Markets and Policies in New Knowledge Economies

William H. Melody

**Policy Primer Papers #2
ICT Governance for Poverty Reduction
IDRC Contract 102450-007**

August 2006

This report is presented as received by IDRC from project recipient(s). It has not been subjected to peer review or other review processes.

This work is used with the permission of LIRNE.NET (Learning Initiatives on Reforms for Network Economies).

© 2006, LIRNE.NET (Learning Initiatives on Reforms for Network Economies).

Markets and policies in new knowledge economies

William H. Melody

Introduction

All economies are shaped significantly by the opportunities provided for generating and communicating information. These activities are essential for the development and sharing of knowledge, and for markets to function at all. They have powerful influences over how and what knowledge is developed, as well as the scope, efficiency, and limits of markets, and the nature of economic development. Continuing dramatic improvements in information and communication technologies and services (ICTS) - for example, the Internet, mobile phones, electronic banking, etc. - are changing quite significantly the ways that knowledge is generated and communicated, and thereby the ways that firms operate, markets function, and economies develop. They are providing a new electronic communication foundation or infrastructure for the economy, capable of transmitting all forms of information (voice, data, pictures, music, film, and video) instantly over global networks at dramatically reduced costs, providing a quantum leap in the number and variety of opportunities for generating and communicating information in advanced 21st century economies.

As these new ICTS are being applied ever more widely and intensively there is increasing evidence that the economies of technologically advanced countries are in the process of moving beyond the industrial capitalism of the 20th century to information and communication based 'knowledge economies' for the 21st, that is, economies where the major driving force for economic growth and development is activities relating to the generation, distribution, and application of knowledge. This transformation is exhibited not only by the rapid growth and development of new ICTS, but more importantly by their pervasive application throughout virtually all sectors of the economy (Freeman and Louça 2001).

The electronics, computing, telecommunication, media and information content (film, TV, publishing, libraries, etc.) industries constitute a trillion pound plus global industry sector. It is the fastest growing sector of the global economy and is expected to remain so for the foreseeable future. Most national governments are counting on these industries to provide the primary stimulus to their future economic growth by stimulating productivity improvements in all sectors of the economy. Moreover, this transformation is expected to bring profound changes in the form and structure not only of economic systems, but also of social, cultural, and political systems. Thus, there is considerable research, public discussion, and government policy rhetoric relating to 'information' and 'knowledge' societies, as well as economies (Castells 1996, 1997, 1998).

The 20th century industrial economy has been influenced greatly by ICTS (for example, telephone, radio and television, computing) and the development of new knowledge for economic applications, particularly from new industrial technologies in many fields (Mokyr 2002). The telephone, and even the earlier telegraph, facilitated the geographical expansion of business activity, and radio and television provided an efficient mechanism for the mass marketing necessary to justify mass production. Therefore, the 21st century economy under examination here is labelled the 'new knowledge economy'. The focus is placed on the more recent ICTS and knowledge resource developments, that is, in the post Internet period beginning in the mid 1980s, that are expected to play a much greater role in the future economy than ICTS and knowledge have played in the past industrial economy, and make possible structural and institutional changes of even greater significance.

This paper examines some of the generic developments and key characteristics of evolving 21st century new knowledge economies that are becoming evident, their implications for market development, and the important issues they are raising for government policy and regulation relating to market governance in the new economy. It does not take up the very important issues arising from the great differences among national economies, most particularly the enormous gulf between developed and developing country economies.

The information/communication foundation of institutions

The term 'information' is a static 'stock' concept. It suggests inventories of different kinds of knowledge as valuable assets. The term 'communication' is a dynamic 'flow' concept, reflecting the process of transmission and exchange of information, knowledge, and values. The exchanges often create new information influencing knowledge and values. The concepts of 'information' and 'communication' provide different analytical perspectives on two essential dimensions of knowledge.

An examination of the information characteristics of any economy must focus on its communication characteristics, for they will determine the terms of access to information, and the possibilities for sharing it and thereby developing new information. New communication networks are often the driving force behind the distribution of vast quantities of new information that have been generated precisely because of the new opportunities for communication. This interdependence between information and communication as essential elements of knowledge generation, distribution, and application has led to the adoption of a variety of labels for the new 21st century economies, including 'information', 'network', 'weightless', and 'knowledge', the label adopted here. They are all examining aspects of the same trends, although often from very different perspectives (Webster 1995).

In the broadest sense, the social, cultural, political, and economic institutions in any society can be defined in terms of the characteristics of the shared information within and among those institutions. In the narrower economic sense, it has been recognized generally that the most important resource affecting the economic efficiency of any economy, industry, production

process, or household is information and its effective communication. Now that entire industries and major sectors of technologically advanced economies are devoted to information - the search for it, the creation of it, the manufacture, storage, classification, summarization, selection, editing, interpretation, hoarding, purchase, sale, and broadcast of it - the economic characteristics of information and communication are being recognized as key factors shaping the new knowledge economy.

Perhaps the most significant change between technologically advanced economies today and the oral tradition of the Greek city-state - still practised by some native cultures today - is not in the role of information in the economy, but in the way that information processes and communication networks are institutionalized. The dominant form of information creation and exchange has shifted from oral discourse flowing outside the bounds of formal market arrangements to the establishment of formal information generating, storage, and transmission institutions, the commoditization of information and its exchange through markets. Perhaps the most significant change is not the overwhelming volume of information now available, but the institutional structure for its generation and distribution, and the increasing centrality of markets and government policies in shaping that structure (Melody 1987).

The importance of information flows and communication networks to the establishment and maintenance of particular institutions and power structures has been understood since earliest times. Trade routes and communication links were deliberately designed to maintain centres of power and to overcome international comparative disadvantages. Britain and other former colonial powers still benefit substantially from their historically established communication links with their former colonies, long after the formal demise of the empires. Universal telephone service was adopted as an important government policy objective in the US and other countries to encourage economic and social interaction within the country as a way of promoting national markets and political unity. The EU is specifically promoting increased communication and information exchange among EU member countries as a foundation for stimulating trade, creating a single European market, fostering a new European identity, and making Europe a stronger competitor in international markets and a more influential player in world affairs (Melody 2003).

The transformation to new knowledge economies

The primary forces driving the transformation of national, regional, and global economies have arisen from major changes in technologies, markets, and governance policies. It is the synergistic combination of the development and increasingly pervasive applications of ICTs, and the worldwide movement to market liberalization and deregulation that is stimulating quite fundamental changes in many markets and industries. A change in national telecommunication (telecom) governance policies around the world during the latter part of the 20th century, from public service monopolies to more open competitive markets, prepared the ground for the convergence of information technologies (IT) from the computing and electronics industries with

communication technologies from telecommunication and broadcasting. This fundamental change in telecom sector policy and regulatory governance marks the beginning of the ICT revolution (Melody 1996).

In an agricultural economy, land is the most valuable resource attracting investment capital. In an industrial economy, manufacturing plants, machinery, and other forms of physical capital are the focal points of investment activity. In the evolving knowledge economy, the expectation is that skilled and well-trained people, and the information and communication tools they use, will be the central resource attracting investment because knowledge is produced, stored, and applied primarily by humans. Whereas the industrial economy has been an era of physical capital with labour employed primarily to facilitate the requirements of machines, the new knowledge economy is optimistically expected to be one where investment in the skills, competences, and capabilities of people, that is, human capital, is the central investment activity (Freeman and Soete 1994).

One important distinction between the industrial economy and the evolving new knowledge economy is the shift in emphasis from a primary focus on the transformation of material resources, that is, the physical production of goods, to a focus on improving and facilitating transaction capabilities, that is, generating and communicating information to facilitate exchange transactions. The ICTS sector is driving productivity reforms primarily by improving the information and communication activities related to transactions. Although transaction activities as a measurable sector of the macro economy have not been subject to systematic ongoing research, the available evidence indicates that despite significant improvements in information processing and communication opportunities during the 20th century, the proportion of resources allocated to transactions increased significantly. One major study of the US economy concluded that between 1870 and 1970 transactional activities, as compared to transformational activities, had risen from one quarter to almost one half of US gross domestic product (GDP) (Wallis and North 1986).

This trend is explained primarily by the geographic expansion of markets in many industries to international and global dimensions, which increased transaction costs, but often made possible significant economies of scale and scope in mass production, thereby justifying the allocation of increased resources to transactions in expanded geographical markets. In new knowledge economy markets, advances in IT are making it possible to push back the intensive limits on information by reducing the cost of generating more and more kinds of data and information services. Advances in telecom technologies are making it possible to push back the extensive geographical limit of efficient communication to extend markets (Melody 1985).

Distinguishing features of new knowledge economies

The most important features of the new knowledge economy that require detailed examination of their essential characteristics, and their implications for market governance policies, are:

- 1) the development and use of advanced high speed (broadband) telecom networks - the *information infrastructure* - for electronic commerce and related next generation Internet and knowledge economy activities;
- 2) the conditions governing the increased generation and use of *information content* both as economic resources and as products exchanged in markets;
- 3) a much greater emphasis on the role of *human capital* as the principal producer, repository, disseminator and applier of information and knowledge;
- 4) *applications* of ICT services and content to increase productivity throughout all sectors of the economy, initially by improving transactional capabilities and reducing transactions costs, and then by stimulating changes in the structure of organizations, industries, and markets;
- 5) the likely *structure* and *efficiency* of new knowledge economy markets, and the significance of major market failures (for example, monopoly) and market externalities (benefits or costs to society that cannot be captured in market relations);
- 6) the implications for *international trade* in a global knowledge economy.

Based on an understanding of the evolving market characteristics in the new knowledge economy, updated government policies and regulations will need to be developed. They will need to clear away the barriers of inherited policies and regulations that have become obsolete in the new economy, facilitate the desired and constrain the undesired market developments in the new knowledge economy at both national and international levels, and ensure that non-market policy objectives are implemented, for example, universal access to the communication network (Melody 2003; Sheehan 1997).

Access to the new information infrastructure network

The foundation for the advanced information and communication services that will drive the knowledge economy will be a transformed and upgraded telecom network that will provide the information infrastructure over which the new electronic services and information content will be supplied. Broadband telecom network connections will be needed in the workplace, home, schools, and other centres of activity, just as the telephone is needed now. This new information infrastructure will be the most important public utility of the 21st century economy.

The conversion of telecom networks and all forms of communication and information content to the *digital standards* of computing has created an electronic network infrastructure that facilitates the convergence of formerly discrete telecom services on a single telecom network. More recently, extended applications of Internet Protocol (IP) have permitted the convergence of services on the Internet to include, not only data, pictures, music and video, but also voice communication, including public voice services. Voice over IP (VoIP) is a major step in the ongoing convergence process. It means that now IP permits all types of communication services to be provided in an integrated manner over the Internet by many different service providers. These Internet

services in turn are provided over the digital network facilities of telecom operators.

The convergence of telecom services using IP also completes a technical unbundling process that allows for a clear separation of facility network capacity from the services supplied over those facilities. In the historic model of telephone service supply, services and facilities were integrated by technical design as both were supplied by a single telephone monopoly in any geographical area. IP has permitted a clear separation between network facilities and services, first for data, then pictures, audio, video, and private voice networks, and now public voice networks as well. Layer 1 is the Network Infrastructure Facilities (cables, wires, microwave towers, mobile cells, satellites, etc.) that provide the raw capacity that enables telecom connections. Layer 2 is Network Management, the standards and protocols that permit the routing and determine the technical quality of network services. IP has permitted the gradual unbundling of network services from infrastructure facilities. Layer 3 is the provision of Communication Services using IP (for example, voice, data, Internet access). Layer 4 is Information Content Services (for example, websites) that are accessible on a network using IP (Melody 1996).

With IP applied to all services, the structure of the overall market for communication services is radically changed from the former vertically integrated structure where most services and facilities were licensed and provided together by a vertically integrated monopoly telephone company, to a horizontally structured market consisting of separate markets for network infrastructure capacity, network management, communication services, and information services. This significantly reduces the barriers to entry to this market and its new submarkets and provides new opportunities for increased participation by new players, entering markets at any level, and providing a wide variety of different service packages. It allows new services and network intelligence to be developed by users at the fringes of the telecom network, rather than only by telecom operators at the centre. This is the open network model extending the unbundled network access opportunities of the Internet to a new level in Next Generation Networks (NGN).

Although IP was developed for, and initially applied on the Internet, the largest users of IP are the incumbent telephone operators around the world. They are in the process of converting their entire telecom systems to IP because of the enormous cost reductions to be achieved and the potential for providing new converged services in the future information economy, including e-commerce, e-government and other e-application services. At the same time, the extended application of IP by Internet service providers (ISP) to include public voice services has opened a major new service opportunity for them, and introduced a significant new element of participation and competition in the supply of both public voice services and new converged services.

It is now possible to provide fixed and mobile telecom, TV and Internet access to consumers as a single package of services, sometimes called triple

play or quadruple play services. More importantly, it provides new opportunities for users to search for and disseminate information, develop common interest networks, experiment, innovate and share information, as an integral set of activities in developing and applying knowledge, including the development of new services.

ICTS convergence has raised a number of issues of adjustment to the new environment by telephone operators and service providers, by policymakers and regulators, and by users. Any major technological improvement that dramatically reduces unit costs and expands service capabilities offers the potential for enormous benefits in terms of network and market expansion, cost and price reductions, and new services development. But it also brings the threat of significant losses to those benefiting from the traditional way of doing things - in this case incumbent telecom operators - in a process of 'creative destruction' (Schumpeter 1950). This also requires that the inherited structure of policies and regulations be reassessed and modified to meet the new challenges and opportunities unfolding.

Although the telecom sector has been liberalized and competition permitted or encouraged in some or all communication services markets, telecom regulatory authorities are being given new policy remits by governments for the new environment. In the UK, for example, five communication regulatory authorities were merged into one (OFCOM) early in the 21st century. Competition has proven to be an effective instrument for stimulating new information services development on the physical infrastructure, but infrastructure competition, especially for local distribution and in rural areas generally has not developed significantly. Most incumbent former monopoly telecom operators have not willingly unbundled their physical networks to provide access to ISPs and other competitive services suppliers, and in many countries they are attempting to reassert their monopoly control over NGN development. In addition, the upgrading of existing telecom networks to broadband standards is far from universally available in most countries (Trebing 1997).

Thus, most countries are in the process of developing and/or implementing policies and regulations relating to the development of new national broadband information infrastructures and the terms of access to them by information service providers and users. It is now being recognized that in the future economy those without access to basic information infrastructure services will be denied access to information and the ability to act on the content conveyed, whether it relates to economic, social, cultural, or political activity. The universal access requirements established during the telephone era will need to expand in the new knowledge economy as people will need not only the opportunity to communicate electronically, but also access to a variety of public information. For example, increasingly job opportunities are only advertised on Internet websites.

At both national and international levels there is already concern about a 'digital divide' in access to a modern information infrastructure both within

countries, including the UK, the US, and other wealthy countries, and between the rich and poor countries. In the industrial economy, the majority of the world's population never had access to a telephone. Although the mobile phone explosion of recent years has expanded global coverage significantly, it is apparent that based on current trends the problem of information infrastructure access will deny the majority of the world's population access to the new knowledge economy (Melody 2003).

It is now clear that the conditions for access to the information infrastructure of the knowledge economy, at both national and international levels, will be heavily influenced by the governance policies that are established and the effectiveness of their implementation. If the matter is left to the market alone, access to the knowledge economy could be even more narrow and exclusive than it has been to the industrial economy. Although the need for governance policies to extend access beyond that which the market is likely to provide is widely recognized, the extent of government policy commitments to maintain and extend access opportunities has yet to be determined.

Information content and intellectual property rights (IPR)

The stock of knowledge in society at any time, that is, the skills and education of the populace, the detailed factual information relating to such things as the working of production processes, the interrelationships and interdependencies of different sectors of the economy, etc., collectively represent a primary resource of the economy. The value of this stock of knowledge to society depends upon how pervasively it is spread throughout society, and upon the institutions for maintaining, replenishing, and expanding the stock of knowledge, that is, its education and training system, research generating new knowledge, and experience.

Once information has been generated, the cost of replicating it is very much lower than the cost of generating it in the initial instance. The use or consumption of information by one user does not destroy it, as occurs with almost all other economic resources and products. The information remains to be consumed by others, the only additional costs being those associated with bringing the same information and additional consumers of it together under conditions where it can be consumed, that is, learned. And once a given level of penetration is reached, with many types of information a multiplier effect comes into play, as the information is spread throughout society by informal communication processes outside the formal processes of learning and training.

In addition, many information and knowledge markets are characterized by large positive externalities. They provide significant benefits to many people other than those engaged in the market transaction exchanging information. Thus the cost and benefit economics of replicating, consuming, and sharing knowledge are extremely favourable for its widespread distribution (Varian and Shapiro 1999).

Information and knowledge markets have been heavily influenced by governance policies throughout the history of the industrial economy.

Governance policies have been directed toward balancing society's interest in promoting innovation by protecting the innovator's new knowledge, and in permitting access to that knowledge for useful application and the development of additional knowledge. For the industrial economy, patent laws have provided protection for knowledge relating to new inventions and their applications for a specified period of time - in most developed countries about 17 years. Alexander Graham Bell obtained his telephone patent in 1878, after which he licensed the development of monopoly telephone systems in many countries. The patent expired in 1895, after which there was a flurry of new entrants to the telephone industry in the US and some other countries who introduced many new innovations building on Bell's original work.

For cultural products produced by authors, artists, musicians, and others, copyright laws have served a similar purpose, to protect the intellectual property of the producer so as to encourage production, but to limit this protection to a specified time period so as to encourage distribution and further development. For example, the US Copyright Act of 1790 granted American authors a monopoly right to publish their work for 14 years, and to renew for another 14 years. Most other countries have copyright laws applying the same principles. At the end of the specified periods this knowledge enters the public domain. Although patent laws have been a cornerstone of the industrial economy, it is already apparent that copyright laws may be even more important in the knowledge economy.

Over the recent period of implementation of liberalization policies in telecom, changes in patent and copyright laws have moved in the opposite direction. Patent and copyright protection in the ICTS and other sectors of the economy have been expanded significantly. Developments in the US have set the standard that has tended to be followed in other countries. Until the 1980s, computer software was routinely excluded from patent protection. Beginning in the late 1980s, a series of US court decisions has permitted and strengthened patent protection for software programs. This has both enhanced the monopoly power of Microsoft and other firms, and helped spawn LINUX and the open-source software movement in response to Microsoft's monopoly power (Lessig 2001).

Since its inception the breadth and time period of the US Copyright Act has been extended several times. In 1976, the third major revision extended the term of protection to life of the author plus fifty years, but introduced the doctrines of fair use (for example, for education) and first sale (allowing a resale market). In 1998, with the Internet threatening uncontrolled electronic distribution of copyrighted material, especially music and potentially film, the Sonny Bono Copyright Term Extension Act extended the protection period to the life of the author plus 70 years, and the Digital Millennium Copyright Act prohibits gaining unauthorized access to a work by circumventing a technological protection measure put in place by the copyright owner. During the late 20th century period of transformation toward a new knowledge economy, as the basic characteristics of information and communication-based knowledge markets in the new knowledge economy have come into play,

monopoly rights over both old and new information content and its transmission have been strengthened significantly by governance policies.

This in turn has influenced the development of new information services. Specialized information services for the private consumption of a restricted clientele are growing rapidly. They range from special research studies of the details of international markets for trans-national corporations to confidential assessments of the negotiating strength of a specific customer, competitor, trade union, or government. They include remote sensing satellite data identifying the detailed swimming patterns of schools of fish, and pinpointing the location of mineral resources and the progress of crop growth in distant countries. They include the DNA of specialized crops and even people in distant lands. At the same time many governments have taken steps to attempt to restrain the march of information markets into the details of people's personal lives and to regulate the conditions of access to certain kinds of data banks, for example, credit, medical, and tax files, under new privacy laws.

It is already apparent that the economic characteristics of (1) the relatively high costs of establishing most databases, and information and knowledge services, and (2) the relatively low costs of extending the market for services already created, provide a powerful tendency toward centralization and monopoly on an international basis. Thus, competitive forces in most information and knowledge markets will be rather weak or non-existent. This raises fundamental issues of national and international government policy relating to IPR and competition policy (Melody 2003).

The inherent conflict between maximizing profit in quasi-monopoly information and knowledge markets and the social efficiency of societal distribution at marginal costs approaching zero has become a central issue in policy debates about knowledge economy governance policies. The current application of IPR in software, publishing, music, film, as well in pharmaceuticals, medicine, and other areas is directed to increasing protection for monopoly owners of content, thereby limiting distribution severely. Thus, information and knowledge markets will continue to function inefficiently and lead to increases in the gap between rich and poor, both within countries and between countries. The efficiency, productivity, and innovation in these knowledge economy markets will be determined by the governance policies established as the new knowledge economy develops.

Human capital

The industrial economy has been characterized by waves of investment in capital-intensive physical assets such as the railway, electricity, natural gas, vehicles and roads, airlines, and the mass production of machines and durable goods. These past innovations required massive employment of relatively unskilled and semi-skilled labour. In contrast, the knowledge economy revolution is being driven primarily by skilled labour, but so far representing a much smaller portion of the total labour force. For the first time in the history of capitalism, the primary driving economic force may not be physical capital, but

human capital - the investment in skilled labour. At this stage of development, the open questions are, how much investment, and what proportion of the labour force (Freeman and Soete (1994)?

Increased investment in skilled labour is evident in the research and development (R&D) that is yielding continuous innovations in the ICTS and many other industries, which are increasingly dominated by software, services, and content development. Just as computer software grew from almost nothing in the mid-1960s to become over 10 times larger than the computer hardware industry by the turn of the century, so a similar process has now begun in the telecom sector, most dramatically illustrated by the explosion of Internet services. The driving force is the information content and the communication capabilities, not the physical facility systems.

This is also true in the applications of ICTS throughout the economy, and even in the delivery of new services to the home. Experimental trials around the world have demonstrated that investments in state of the art technologies and services are not enough. There must be far more investment both in understanding consumer needs and in enhancing the consumer skill base before there will be widespread acceptance of these services. Thus there is increasing evidence that the pace at which the new technologies and services are driving the process of transformation to a knowledge economy depends primarily on the pace of productive investment in human capital, that is, the skill base of labour, management, consumers, and policy makers (Sheehan and Tegart 1998).

In some respects this could be a very positive state of affairs for it implies some very promising tendencies. First, it could significantly reduce the oscillations in the business cycle, which in the past have been aggravated by the rise and fall of enormous investments in location-specific fixed physical capital. Investment in human capital can avoid these aggravated fluctuations. Further, in times of deficient aggregate demand in a knowledge economy, it will be investment in human capital that should be the priority need to stimulate renewed economic growth.

A second important characteristic of investment in human capital is that it narrows the gaps between the traditional distinct economic activities of investment, employment, service provision and benefit to the population. In the industrial economy, investment frequently does not provide satisfactory employment, and a significant portion of the economy cannot take advantage of the goods and services on offer. If the priority infrastructure investment is in human capital, then the needs of people as workers, as consumers and as citizens, can be met with the same investment. It is both a resource input and a service output at the same time.

Yet despite the rhetoric about the knowledge economy and human capital, the commitment to investment in education and training by governments in the leading industrialized countries has been declining in the early years of the 21st century. Corporate training remains limited and specialized because of

a recognition that firms may not realize the benefits of their investments in human capital as the enhanced skill may open opportunities for employees with competitors. Privately funded education and training is increasing among the wealthy. Moreover, many jobs and people are being disadvantaged in the new economy as a result of losses of job security, benefits, and real wages. Some evidence suggests that it is only a relatively small minority that is benefiting from employment in new knowledge economy jobs (Huws 2002a,b).

These trends suggest that current governance policies with respect to human capital development are directed toward enhancing the human capital of a smaller rather than a larger portion of the population. This is likely to promote an effective labour participation rate in the knowledge economy that is far lower than it need be and conceivably even lower than in the industrial economy. Once again, the shape and direction of a key resource for the knowledge economy will be influenced significantly by governance policies.

ICT services applications for productivity improvement

Although the information and communication sector of the economy is extremely important in providing a foundation for a modern economy, the major transformations that will bring about a new knowledge economy lie elsewhere. For the most part, the new ICTS are intermediate goods. Their primary benefit lies not in their intrinsic value, but in their applications for other purposes. The productivity potential for a new knowledge economy lies in the potential for applying these technologies and services to change the way business is done, for example, electronic commerce, the way organizations and industries are structured, and the way people choose to conduct their lives (Castells 1996, 1997, 1998).

Banking and finance have been the leading applications sector. The industry has been restructured on a global basis. Banks have reorganized the way they function. One can readily recognize that we do our banking and finance very differently today than 10 or even five years ago. The international liberalization of finance has created highly liquid and flexible global currency and securities markets. But the deregulation of financial markets, in combination with new global information and communication financial networks, has permitted such rapid movements of money capital around the world that it has become a major cause of economic instability. The volume of international financial exchanges is now more than 300 times greater than the value of trade in goods and services, which has prompted some analysts to interpret the information economy as 'casino capitalism' (Kay 2003). This is associated with increased volatility in stock markets, currency markets, and economic activity in regions and small nations that are vulnerable to the resource allocation decisions of financial speculators. Effective financial governance for the new economy has not yet been established.

Other industry sectors, including transport and tourism, manufacturing, education, and other services are at earlier stages in their applications of ICTS for sector transformation. Public sector applications lag noticeably behind private sector applications. This is particularly ironic because it is in the sectors

of education, health, and government administration that the potential benefits of ICTS are arguably the greatest. The extent of productivity improvements for the economy will depend significantly upon innovative service applications in the public sector. The governance policies for the applications sectors will determine the scope and extent of applications and the productivity improvements achieved.

The prevalent market structure: Network oligopoly

It is apparent that the knowledge economy increasingly will become a network economy as electronic communication networks provide the platform for the supply of ever more services and content. Communication networks are characterized by significant economies of scale and scope, and many also enable extensive positive network externalities. The primary industries of the ICT sector - telecom, network software and services, and the content sectors of music, film, television, etc., are already increasingly concentrated oligopolies, many on a global basis. Many of these firms are linking directly into services applications, most of which will also be supplied on a network basis. The available evidence suggests that the dominant industry characteristic in the knowledge economy will be highly concentrated network oligopoly markets. This raises a dilemma for governments with respect to the application of existing competition laws and/or direct industry regulation.

The economic theory of oligopoly markets (only a few large suppliers) explains how they tend to be characterized by inefficiency, instability, and indeterminacy. Too little output is produced and too much capacity is established for that output so that excess capacity will serve as an artificial barrier to entry. The rivalry among the few suppliers tends to focus on non-price factors, often heavy marketing which provides an additional artificial barrier to entry. Prices are generally set well above costs, and significant price discrimination is typical, except when external factors or an increase in uncertainty stimulates a price war. Concentrated oligopolies often engage in explicit or implicit self-regulation to preserve market share and oligopoly profits. With significant market power, they are capable of negotiating terms for minimal payments to resource suppliers, including labour, and distributors, capturing the productivity gains from the new economy for themselves (Dew-Becker and Gordon 2005).

Some oligopolies engage in significant R&D and technological development, which can lead to crashing the barriers to entry of another industry, inter-industry rivalry, and 'waves of creative destruction'. But under these circumstances the transition to the new knowledge economy is likely to be highly inefficient and unstable, leading to new industry arrangements that are most often simply restructured oligopoly (Lynn 2005).

At the international level, ongoing negotiations with respect to knowledge economy issues are focused on the establishment of patent and copyright laws in developing countries paralleling those in the developed, for the purpose of protecting information products, services, and content that they wish to sell into developing country markets. This trend is strengthening concentrated oligopoly

in global markets both in ICTS and other sectors, pointing to a global knowledge economy that will be even more unbalanced with respect to the disparities between rich and poor countries than experienced in the industrial economy.

Markets with the characteristics of concentrated oligopoly need rules if operator initiative is to be directed toward efficiency and the expansion rather than the restriction of supply. Regulation can influence where the oligopoly market rivalry is focused in the information infrastructure sector. Strengthened competition laws focused particularly on concentrated oligopoly, rather than simply on monopoly power will be necessary to help make information and knowledge network services markets workable. The imperfections in the most prevalent knowledge economy markets will be greater than in industrial economy markets, requiring more active and sophisticated industry structure governance policies than in the past. Thus, the efficiency, productivity and innovation of new knowledge economy markets will depend heavily upon the effectiveness of the market governance policies (Melody 2003).

Defining the public interest in public information

Liberalization reforms of the telecom and other infrastructure segments of the economy have provided much-needed new opportunities for private initiative for the development of the infrastructure, services, content, and applications that will drive new knowledge economy development. But governments have yet to mark out the domain of the public interest in the new economy. In addition to universal access to Internet services, there will be the universal information needs of the general public in the new knowledge economy. If economies and societies are going through a transformation to a condition where information and knowledge take on increasing importance, and are provided over next generation networks, then presumably there will be a definable set of public information needs essential to the maintenance of participatory democracy. This information will be necessary for individuals to function effectively as workers (job information, tele-working), consumers (tele-shopping, banking, entertainment information), citizens (e-voting, government information), and community participants (social and cultural networks). A rich public information commons in the new electronic space will be essential if new knowledge economies are to be inclusive rather than exclusive and fragmented. How it is defined and developed will be determined by government policies (Melody 1990; Ruggles 2005),

Conceptualizing and measuring the new knowledge economy

The new economy is based increasingly on new ICTS, new applications throughout the economy, new production processes, and new resource requirements. These do not fit well into the established ways of conceptualizing and measuring economic activity that were developed for the industrial economy, especially as knowledge, information, and communication activities have not even been recognized as significant factors in the underlying economic theory and measurement methodologies. There is no conceptual foundation for determining economic values for knowledge or the human 'assets' in which it is embodied (Miles and contributors 1990).

New theory and measurement tools need to be developed to fully understand and measure economic activity in new knowledge economies. Increasing attention is being addressed to such issues as human capital and knowledge capital as important new resources in addition to physical production and financial capital. Education, training, and research and development expenditures are beginning to be recognized as important investments. The OECD and other international agencies are examining various aspects of these issues, and academic research is increasing. One recent study of knowledge economy competitiveness defined the knowledge-base of an economy as 'the capacity and capability to create and innovate new ideas, thoughts, processes and products, and to translate these into economic value and wealth' (Huggins, Izushi, and Davis 2005: 1). This is progress, but there is a long way to go before the transformation in economic theory and measurement will provide a satisfactory understanding of the new knowledge economy and its implications.

Conclusion

This chapter has demonstrated that the most distinctive features of the new knowledge economy are the predominance of advanced telecommunication networks and information content produced and distributed over those networks. It is an electronic, or e-economy. But both communication networks and information content are characterized by major market imperfections, accentuated by high initial investment costs, major economies of scale and scope, extensive positive externalities and low marginal costs. In addition, there are important extra market public interest objectives to be satisfied, including universal access to a minimal set of communication opportunities and public information. More than the industrial economy, the new knowledge economy will require the guidance of effective governance policies if the potential benefits are to be achieved. As a result government policy and regulation at national, regional, and international levels will play a very large role in shaping the growth and development of the new knowledge economy (Sheehan 1997).

This paper has identified some distinctive characteristics and priority policy implications of the new knowledge economy, and signalled the directions in which governance policies must change if the new knowledge economy is to function more efficiently and inclusively than the old industrial economy. The analysis has demonstrated that it cannot be assumed the new economy will generate superior results to the old, or be more inclusive than the old. Although it offers great potential, it also offers possibilities for systemic market failure if it is not governed effectively.

Sustained growth in future knowledge economies will require investments in human capital as a high priority policy issue for governments - for macro economic management of the economy, for enhancing the micro economic performance of specific economic sectors, for building competitive advantage in regional and global markets, and for enhancing individual income and well being. This suggests that the new knowledge economy could provide for a considerably higher level of human development than the industrial economy, for the conversion of what we have known as the 'labour force' into information or knowledge workers, and for a significant expansion in investment

in education, training, research, and development - the major formal knowledge generating and distribution activities.

It also suggests the possibility for a more widespread distribution of the wealth generated in the knowledge economy because the human resources attracting this increased investment are also workers and consumers. If successful, the so-called 'economic man' of industrial capitalism, the servant of accumulating physical capital, may be transformed into a multi-dimensional human being whose human development is served by investment in the accumulation of human capital. But as of this writing, governments have not yet begun to implement the governance structure necessary to realize the potential benefits of the new knowledge economy, and the trend of economic development is primarily in the opposite direction.

References

- Castells, M. (1996). *The Information Age: Economy, Society and Culture Volume I: The Rise of the Network Society*. Oxford, Blackwell.
- (1997). *The Information Age: Economy, Society and Culture Volume II: The Power of Identity*. Oxford, Blackwell.
- (1998). *The Information Age: Economy, Society and Culture Volume III: End of Millennium*. Oxford, Blackwell.
- Dew-Becker, I. and Gordon, R. J. (2005). *Where did the Productivity Growth Go?* Washington DC: Center for Economic Policy Research.
- Freeman, C. and Louça, F. (2001). *As Time Goes By: From the Industrial Revolutions to the Information Revolution*. Oxford: Oxford University Press.
- and Soete, L. (1994). *Work for All or Mass Unemployment*. London: Pinter Publishers.
- Huggins, R., Izushi, H., and Davis, W. (2005). *World Knowledge Competitiveness Index 2005*. Pontypridd, Wales: Robert Huggins Associates.
- Huws, U. (2002a) 'The Restructuring of Employment in the Information Society and its Implications for Social Protection' in G. Bechmann, B.-J. Krings, and M. Rader (eds) *Work Organization and Social Exclusion in the European Information Society*, Frankfurt: Campus Frankfurt/M, 139-52.
- (2002b) 'E-work in a Global Economy' in B. Stanford-Smith, E. Chiozza, and M. Edin (eds), *Challenges and Achievements in E-business and E-work*. Amsterdam: IOS Press, 43-69.
- Kay, J. (2003). *The Truth About Markets: Why Some Nations are Rich but Most Remain Poor*. London: Penguin Books.
- Lessig, L. (2001). *The Future of Ideas: The Fate of the Commons in a Connected World*. New York: Random House.
- Lynn, B. C. (2005). *End of the Line, The Rise and Coming Fall of the Global Corporation*. New York: Doubleday
- Melody, W. H. (1985). 'The Information Society: Implications for Economic Institutions and Market Theory'. *Journal of Economic Issues*, 19(2): 523-39.
- (1987). 'Information: An Emerging Dimension of Institutional Analysis'. *Journal of Economic Issues*, 21(3): 1313-50.
- (1990). 'Communication Policy in the Global Information Economy: Whither the Public Interest?', in *Public Communication: The New Imperatives. Future Directions for Media Research*, M. Ferguson (ed.) London: Sage, 16-39.

- (1996). 'Toward a Framework for Designing Information Society Policies'. *Telecommunications Policy* 20(4): 243-59.
- (2003). 'Policy Implications of the New Information Economy', in M. Tool and P. Bush (eds), *Institutional Analysis and Economic Policy*. Dordrecht, NL: Kluwer, 411-32.
- Miles, I. and contributors (1990). *Mapping and Measuring the Information Economy*. Boston Spa: British Library (LIR Report 77).
- Mokyr, J. (2002). *The Gifts of Athena*. Princeton, NJ: Princeton University Press.
- Ruggles, M. (2005). *Automating Interaction: Formal and Informal Knowledge in the Digital Network Economy*. Cresskill, NJ: Hampton Press.
- Schumpeter, J. A. (1950). *Capitalism, Socialism and Democracy*, (3rd ed.). New York: Harper.
- Sheehan, P. (1997). 'Learning to Govern in the Knowledge Economy: Policy Coordination or Institutional Competition?', in OECD (ed) *Industrial Competitiveness in the Knowledge-Based Economy: The New Role of Governments*. OECD, Paris, 239-47.
- and Tegart, G. (eds) (1998). *Working for the Future: Technology and Employment in the Global Knowledge Economy*. Melbourne: Victoria University Press.
- Trebing, H.M. (1997). 'Emerging Market Structures and Options for Regulatory Reform in Public Utility Industries' in W. H. Melody (ed) *Telecom Reform: Principles, Policies and Regulatory Practices*. Lyngby: Technical University of Denmark, 29-40.
- Varian, H. R. and Shapiro, C. (1999). *Information Rules: A Strategic Guide to the Network Economy*. Boston, MA: Harvard Business School Press.
- Wallis, J.J. and North, D.C. (1986) *Measuring the Transaction Sector in the American Economy, 1870-1970*, Chicago, IL: University of Chicago Press.
- Webster, F. (1995). *Theories of the Information Society*. London: Routledge.